

Single Scattering Albedo and Attenuation of Corn at multiple microwave frequencies and viewing angles

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Soil moisture is a key parameter of energy exchange that link the surface and atmosphere. By passive microwave technique, over the past two decades many field experiment data have been acquired and led to a semi-empirical τ - ω model, where vegetation is treated as an uniform layer, and multiple scattering effect are ignored. It works well at grasslands, agricultural crops, and light to moderate vegetation under C-band. To use data of Chinese FY-3 launched in May 2008 to retrieve soil moisture, the scattering and penetrating properties of crop above C-band are largely unknown.

In this paper, a Matrix-Doubling emission model is used to obtain microwave properties of corn at C (6.925GHz), X (10.65GHz) and Ku(18.7GHz) bands. It is based on ray-tracing technique, which could account for multiple scattering inside vegetation layer, as well as that between vegetation and soil surface, at wider frequency range. Total emissions by model simulation are validated by a truck-mounted microwave radiometer in a field experiment at Hebei, China on July 7, 2008. To verify emission from corn layer only, the ground surface of corn field is placed with an Aluminum film, so as to mask the microwave emission from the soil.



Since Matrix-Doubling model is very complicated theory model, it's difficult to relate the dielectric constant of soil directly to the Brightness Temperature, while τ - ω model can, but usually used under C-band. In order to elevate accuracy of SM retrieval in processing satellite data by sensor with high frequencies, we setup a Brightness Temperature database by the M-D model. Results from M-D model are matched with those from τ - ω model at the same soil parameters by least-square deviation, effective single scattering albedo and opacity of corn at these frequencies are retrieved.

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